The Flypaper

Newsletter of the Radio Control Flying Club of Toronto, est. 1957, inc. 1967

March 2004

In this Issue:

Meetings are held in the Cafetorium of the Alexander Mackenzie Senior Public School, 33 Heather Road, Agincourt, *usually* on the first Friday of each month, Oct to May (subject to change – check the Flypaper) Meetings start at 8:00 PM

For the latest club news, photos and other points of interest please check out our web site at: www.rcfctoronto.ca

Weather Forecast: increasingly better weather possible.

Swap Meet season begins….

The 50th anniversary of the Toledo RC Expo (above, from 2003) will happen in April. Sooner and much closer to home is our own RCFCT swap meet on March 5 . For the first time, invitations to the swap meet have been extended to 3 area RC clubs.

President's Message:

Richard Staron

Still getting your MAAC magazine? How about your 2004 RCFCT sticker to show that you are paid up member of the club? I guess this is just a bit of a friendly reminder to get your application and money in to Paul before the snow melts and the field is open to flying.

The latest issue of the MAAC magazine should be read by all members especially the area around the recommended Safety Codes. I guess I could ramble on and on regarding safety but this issue says it all. One thing for sure, flying at the field without your MAAC not paid up will not be allowed or tolerated. You should have it with you at all times or at least inside your flight box. Don't be surprised if someone comes up to you and asks to see your 2004 MAAC card.

How do you guys feel about changing the meeting dates from Friday nights to another night or even changing meeting location in order to reduce cost or even better seating and tables? Let any of the exec know how you feel at the next meeting, email, phone call or whatever.

OK enough of the administrivia stuff above and lets get back to the business of building, flying and having some fun in this hobby. With the weather breaking and feeling a bit better that spring is around the corner, I have been doing a bit

of "hobby cleaning" to get ready for our annual Swap meet so I thought that I would do an inventory on the planes that I own whether they be completed, still in a box or on the bench for repairs. I just about fell off my chair when the tally came up to 22 different aircraft that this bozo owns. How did this happen? Who knows…. but what I do know is that I will be bringing stuff the Swap meet for sure.

Now I will bet that if you guys did an inventory of your "stuff" that all of you would be doing a bit of head shaking as well. You would be surprised how many engines, servos, props, rolls of monokote, plans, airplanes, kits etc that you have "stashed" away to be used for that "future" project(s). For those who don't have enough stuff stashed, it's a great opportunity to start collecting again….hee hee!!!

I look forward to seeing all you guys including the Humber Valley, Richmond Hill and Seaton Valley members at our Swap meet.

Radio Control Flying Club of Toronto

2003 - 2004 Executive positions

President	Richard Staron	416-288-0569	*rstaron@eol.ca*
Secretary	Arthur Krikorian		*arthur@tangestudios.com*
Treasurer	Guy O'Reilly	416-443-1299	*joulavert1@aol.com*
Field Officer	Bob Miller	905-839-7868	*robert.miller2@rogers.com*
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Wings Officer	*Vacant*		

Non-Executive elected positions

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Refreshments	Steve Horwat	416-439-7084	*s.u.horwat@sympatico.ca*
Program Director	*Vacant*		

Meetings and other Events

Mar 5/ 04 -- Annual Swap Meet – NOW with participation from three neighbouring clubs

Apr 2 / 04 – club meeting

May 7/ 04 – the world famous RCFCT Beauty Show

From the Treasurer:

Guy O'Reilly

Business travel is not as glamorous as it seems. But I still prefer it to the alternative… no funds to pay for the toys. This time I am in Calgary. I must say that the weather is much nicer here than in Halifax! Temperature is plus 9C and sunny… but then again it is a weekday. We shall see what the weekend will bring.

During one of my previous trips I visited PMS Hobbies. They have a great selection, no provincial sales tax and no duty to pay on purchases. That translates in 8% more stuff to buy. I will attempt to contact a local club and I will let you know how things worked out. These must be the luckiest people flying out here: flat land as far as the eye can see, spectacular mountains on the horizon, not too many trees, no urban development encroaching on flying areas, and farm land everywhere. Okay there is the odd cow… err… beef and the ubiquitous oil well, but with this kind of country, a flying field should be relatively easy to find, I suspect!

I am sorry I will be missing the March 5, 2004 SWAP MEET. There are a few things I needed to dispose of and I intended bringing them to the meeting. Maybe someone would be interested in a Unionville Hobbies Tiger Moth (flown and crashed); a 2 meter Electra (no motor); or a 40 inch glider wing (it is black and I do not have a fuse for it)? I also have approximately 6 feet of gutter down pipe for anybody interested in building a SPAD plane (see previous month's Fly Paper for details). No unreasonable offer will be refused. Call or email if you are interested.

Club Finances:

Computers were invented to make things simpler, increase leisure time, and to generally improve the quality of our lives. What a disappointment! I think I will go back to good old fashioned columnar pads and abacus. Debits are placed on the left and the credits on the right, one running total on the far right, end of story.

As you know I have started to convert the club financial information to the Quick Books software. The software is extremely flexible and allows the user to add categories and sub-categories that can be further segregated and split and applicable for income, expenses, investments, etc. Any one expense item could be broken down into many general ledger line items, a real gem of efficiency for any organization. Let me tell you that converting to a new software application, however well written, is not as simple as one might assume and does not guarantee success unless a systematic and careful approach is taken. Now just guess where I went wrong in my conversion project. True to form, not unlike what any self-respecting modeller would do, I read the instructions AFTER I started! My problem at this time is to re-input all that I had done by allocating the income and expenses to different categories or sub-categories. Rest assured that we have funds in the account and that expenses are tracked. As I said previously, a minimum of two club executive members are required to authorize and fund withdrawal or payment from the account. By the way, I discovered (to my amazement) that I am in balance! It is just a little hard to prepare a report to prove it at this time. I will be pleased to discuss finance with any member requesting information.

See you at the field when I get back.

ps: I have three planes ready for a test flight… springtime where are you?
Has anybody seen it? Should we place a picture of Spring on milk bottles?

From the Membership Officer:

Paul Battenberg

I have a reminder for everyone. Please attach the 2004 peel and stick decal to your flight box. Its purpose is to identify you as a paid-up member. Having the decal in a prominent place allows everyone else to see that you belong to the club. Since our club is so large, sometimes a member is not recognized by others, and this saves having to ask the member for his membership card, which some people find embarrassing. Also, the combination to the lock at the entrance to the field is written on your membership card. It will be set to the new combination when the field is opened in the spring. Please don't give it to anyone else.

There are presently 85 paid-up members to date this year. That means there are quite a few of you out there who have not paid yet for the upcoming season. Last year we ended up with 145 members, so if you do the math, there's lots of you still to join. Remember, the flying season is fast approaching. The sun is getting a little warmer and the days are getting a little longer, so don't forget to get those dues in. Forms can be down loaded from our web site at www.rcfctoronto.ca on the FORMS page.

If paying by mail, please remember to include a MAAC form if you are including those dues, and please sign it at the bottom. Just one cheque made out to RCFCT. Keep your nose up just a little, and your wings level. That's all folks!

Editor's note:

John Riley

Paul asked me to remind everyone that this is the last issue of *The Flypaper* for those who have not renewed their club membership - surely an unfortunate state of affairs, so why not renew now.

Other interesting stuff….

announcing……

The RCFCT annual Swap meet

with participation from the Seaton Valley, Humber Valley, and Richmond Hill RC clubs

Friday March 5

Alexander Mackenzie Senior Public School

Bring in your unwanted items, and sell them for an enormous profit!

PROPELLER SAFETY CONCERNS

(from the APC website, http://www.apcprop.com/Safety/safety_concerns.html. Submitted by Richard Staron)

All propellers are inherently dangerous. Model airplane propellers are especially dangerous. Model airplane propellers used in high performance racing are extremely dangerous. Model airplane engines designed and modified to achieve maximum operating capabilities create unpredictable and potentially severe loads, leading to various forms of potential propeller failure. Ignoring reasonable safeguards may likely be catastrophic. This concern is the motivation for the following discussion.

Ideally, a product can be designed with credible knowledge of the environment (loads acting on the product) and capabilities of the product to withstand that environment (not fail). There is nothing ideal about designing a model airplane propeller because some major components of propeller loads are very uncertain. The principle load components acting on a propeller are:

Centrifugal (from circular motion causing radial load)
Thrust/drag (from lift and drag acting on blade sections)
Torsional acceleration (from engine combustion and/or pre-ignition)
Vibration (from resonant frequencies or forced excitation)
Another potential source of loading is aero elastic tip flutter. This may be caused by self exciting aerodynamic loads at a resonant frequency.

These loads are discussed next in order.

Centrifugal loads are very predictable, given rotational speed and mass density distribution of a blade. Their contribution to total stress is relatively small.

BEWARE OF PILOTS
So who is it that flies the plane anyway?
by Guy O'Reilly

Some time ago, I made a decision to put a pilot in all my planes: maybe not a full scale person, perhaps a profile, perhaps a cartoon figure. I am re-visiting this decision as I have serious doubts on the effects of placing a pilot in the plane. After all who flies the plane if not thepilot? And what does he do with all his free time?

If we accept that all pilots are by definition onboard and that the pilot is sole master on board, it follows that we, on the ground, are merely suggesting to the plane a direction that we might desire it to go, an attitude to take. Not our fault if it turns left when we say right, up when we say down. The "pilot", the guy in the plane is to blame for these transgressions. This is true as the pilot commands the airplane.

Now, now, I hear you say nonsense such as: "I control the plane with my transmitter." Or "I built the plane correctly therefore it should fly the way it was designed." WRONG!

The pilot of the airplane overrides all control inputs you may send the plane: he commands the plane. Rest assured the pilot is also intent on making your life difficult. He will put all his/her efforts to contradict any request or input you send the receiver.

Certainly reasonable and experience people, you know, the likes of you and me, could not be held accountable for "pilot error"; the most common cause of aircraft meeting an early demise. Without an onboard pilot who could possibly be responsible? Perish the thought that we would be blamed for servos reacting erratically, batteries being prematurely discharged, control horns disengaging, pushrods bending.

Take time this winter to verify carefully your plane and accessories before the flying season is upon us. Pilots will have taken these cold months to discharge batteries, unplug servos, fray cables, puncture covering (a.k.a. hangar rash) and loosen bolts. PILOTS SHOULD BE BANNED! They are the cause of every ill that plague our sport. No matter how careful we are. I think I spotted one trying to get to my flight box. I have to stop him before he messes things about.

Thrust/drag loads are somewhat uncertain due to complexities of aerodynamic environments. The relative axial speed at the prop (at any radial station) is aircraft speed plus the amount the air in front of the blade is accelerated by the mechanics creating thrust. The latter may be approximated using first order classical theory. Much empirical lift/drag data (from wind tunnel tests) exists to quantify lift/drag loads, once relative velocity and angle of attack distributions are established.

Torsional acceleration loads are generally not known. Analytical estimating technique used by Landing Products to quantify torsional acceleration loads suggests that they can become dominant when pre-ignition or detonation occurs. These analytical observations are supported by test experience with very high performance engines running at elevated temperatures. The latter causes a high torsional load (about the engine shaft) which creates high bending stresses, adding to those from centrifugal force and lift/drag effects. These torsional acceleration loads depend on unique conditions for specific engines. Engines "hopped up" for racing appear to be especially prone to create high torsional loads when lean mixtures lead to high cylinder temperatures and pre-ignition/detonation.

Vibration causes additional loads from cyclic motions. These motions occur when resonant frequencies are excited or when cyclic load variations exist on the blade. The magnitude of these variations depends on how close the driving frequency is to the resonant frequency and the level of damping in the propeller material. Engine combustion frequency is an obvious excitation. Obstructions in front of or behind the blade can cause cyclic variations in thrust load. Once a blade starts to flutter, those motions alter the flow, causing variations in loading. High performance engines have caused propeller tips to break, presumably due to fatigue failure from vibration.

Aero-elastic flutter is speculated to be a dominant mechanism causing rapid fatigue failure near a tip when insufficient or destabilizing tip stiffness exists. The interaction between variable loading and deflection induces a high frequency vibration with unpredictable magnitude.

Efficient propeller design practice utilizes analytical/computational models to predict propeller performance and stresses. However, the uncertainty in impressed and inertial loading from complex phenomena requires testing to assure safe performance. Unfortunately, it is not possible to assure testing that convincingly replicates worst case conditions. The large combinations of engines, fuels, temperature, humidity, propeller selection, aircraft performance and pilot practices creates an endless variety of conditions. If the origins of severe loads were well understood, quantified, and measurable, structured testing might be feasible that focuses on worst case stack up of adverse conditions. However, since the origins of severe loads are really not well understood, it is essential to provide sufficient margins in material properties and design to assure safe performance. Propellers that are used in fairly routine and widespread applications (sport and pattern) lend themselves reasonably well to test procedures that provide reasonable confidence. In time, a sufficient data base develops that can be used to empirically quantify performance and "anchor" or "tune" assumptions used in analytical models.

However, propellers that are used for increasingly extreme performance applications do not benefit from the large empirical data base sport and pattern propellers enjoy. Assumptions and design practices developed for current generations of engines may not be valid for emerging engines whose technologies continue to push engine performance to greater extremes. Consequently, propellers that are used in applications where performance is already relatively high (and expanding) must be used with great caution.

An adverse cascading effect occurs when propellers are permitted to absorb moisture in high humidity environments. Composite strength, stiffness and fatigue endurance all reduce with increased moisture content. Reduction in stiffness typically causes resonant frequencies to move toward the driving frequency (increasing torsional loads) and, the reduction in strength reduces fatigue endurance. Composite propellers should be kept dry.

In summary, please abide by the safety practices recommended by propeller manufactures. This is especially important for high performance propellers. Assume that propellers can fail at any time, especially during full power adjustments on the ground. Never stand in or expose others to the plane of the propeller arc.

Glow fuel – in fact it's a gas...

by John Riley

Sources: manufacturer's websites for Wildcat and Powermaster fuels, Klotz lubricants, www.howstuffworks.com, and various auto racing sites

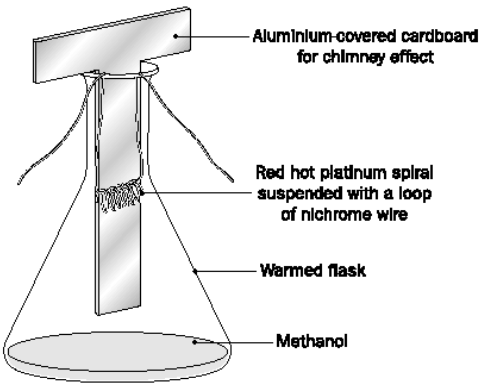
The unique features of both 2 and 4 cycle glow type engines that distinguish them from their gasoline operated cousins are reflected in the type of fuel they use. Since there's lots of choice, it's not hard to find lively arguments amongst RCers over the merits of one brand or formulation of fuel over another, and this is probably helped by the fact that each manufacturer claims that their fuel is the finest ever produced. Here's an overview about the main components of glow fuel.

Above: most glow fuels seem to have names that reflect their manly, high performance attributes

Ideal characteristics: As well as developing lots of power, a good fuel should allow a low, reliable engine idle, provide protective lubrication, and not leave excessive deposits and buildup in the engine. It would be nice if it was really cheap too, but you can't have everything….

Methanol: There are a couple of reasons why this is used, rather than simply mixing some oil into some locally obtained Petro-Can premium unleaded. Methanol acts like a high octane fuel – it can withstand high compression ratios before pre-ignition or detonation occurs. Also, although methanol contains less energy per unit volume than gasoline, it requires less oxygen for complete burning at it's ideal mixture (known as the stoichiometric ratio) than gasoline does. One reason for this is that methanol contains some oxygen (chemical formula: CH_3OH) whereas gasoline is a pure hydrocarbon (octane: C_8H_{18}). Bearing in mind that the limiting factor is the volume of air (oxygen) that a cylinder can draw, the ability to burn more fuel per stroke implies more power. The following table, where the energy in BTUs of various fuels is compared to the air requirement, shows that methanol outperforms gas:

Fuel	BTU/lb fuel	lb of fuel/lb of air	BTU/lb air
Gasoline	20,591	0.066	1359
Ethanol	12,780	0.111	1418
Methanol	9,770	0.156	1524
Nitromethane	5,160	0.588	3034



From a college chemistry course, this is a fun Larry Lightbulb type of science experiment where eye protection is probably a good idea. Once the platinum spiral has been heated, it stays that way as oxygen and methanol fumes react at its surface, generating more heat.

The main reason for the choice of methanol, however, concerns the way in which glow plug ignition works. Glow plug filaments contain, either plated or alloyed, some platinum, which acts as a catalyst for the oxidation of methanol by oxygen. Catalysts act to speed up a chemical reaction without being consumed in the process; platinum does this because the atomic structure of its surface is such that methanol and oxygen molecules can temporarily attach to it and react more easily with each other (sort of like the purpose of soft music during a hot date). The catalytic effect of platinum on methanol is somewhat mild though, and thus heating is required before ignition can occur.

Nitromethane: How does "nitro" add power? Reference to the table above shows that compared to methanol, nitromethane can deliver twice the energy per unit amount of air. Again, this is due in part to nitromethane containing oxygen (chemical formula: CH_3NO_2), twice as much as methanol. Interestingly, nitromethane itself is not that highly flammable or volatile,

particularly compared to gasoline. The increased combustion however, causes an increase in temperature, other things being equal; as a result, nitromethane improves engine idle. Similarly, small engines, with their greater surface area/volume ratio, profit more from the increased heat provided by nitromethane, while some large engines don't benefit much from nitro. Since nitromethane can provoke the onset of pre-ignition or detonation, sometimes the use of high nitro fuel requires a reduction of compression ratio with the use of additional head gaskets.

The auto racing community is big on the use of nitromethane, which is regarded as similar to the addition of nitrous oxide to the engine intake. Top Fuel dragsters, like the one on pictured on the left, can achieve some astounding performance figures: the engine is derived from the legendary Chrysler 426 hemi, and it develops *6,000 horsepower*, running on fuel that is about 94% nitromethane. The fuel consumption is almost *one gallon per second*, which is equivalent to 2 teaspoons of fuel delivered to each cylinder during each intake stroke. What's with the cool looking flames that shoot out? Nitromethane's rate of combustion is less than other fuels like gasoline – consequently, some of it is still burning during the exhaust stroke (after all, these people don't seem to be too worried about fuel economy).

Lubrication: Glow fuel contains either castor oil or a synthetic, or a blend of the two. They both have advantages and drawbacks, and debates rage about which is best, and what % oil should be in the fuel. Generally speaking, castor oil has a higher film strength than synthetic, and can withstand greater heat before breaking down. On the other hand, it leaves greater engine deposits, like carbon buildup and varnish (which is regarded by some as a good protective barrier). The purpose of oil is to reduce friction and heat, assuring longevity of the engine components. Those who prefer castor oil claim that it provides better protection in the event of an inadvertent lean run. The consensus seems to be that most aircraft 2 stroke engines should have at least 18% oil by volume. With the notable exception of Y.S. engines, four stroke engines generally require less oil, because of their reduced operating rpm and half the number of power strokes. The opinion at Wildcat Fuels is that four strokes should use a totally synthetic lubrication package, because castor oil will cause coking of the exhaust valves and gumming and sticking of the lifters. Others suggest a blended oil will allow the lubrication package to benefit from the virtues of both types of oil. Klotz Lubricants is a leading lubricant manufacturer (for things like race cars as well as model engines). Here is their data for their synthetic (Techniplate) and Castor based (Benol) oils:

The seeds of the castor bean plant, which are toxic, contain the oil. Enterprising DIYers can grow their own oil at home with a few of these decorative plants. I guess.

CHARACTERISTICS:

Smoke Rating:	10	1=fog; 10= no smoke
Clean Burn™:	10	1=heavy deposits; 10=no carbon
Film Strength:	5	1=failure; 10=virtually no wear
Viscosity @100°F:	950 SUS 50 W	@ **40°C:** 200 cSt
Pour Point:	-15°F	
Flash Point:	460°F	
RPM Limit:	12-13,000; R/C Model 20,000+	
Rust Prevention:	Contain rust inhibitors. Not recommended as a storage lubricant.	

CHARACTERISTICS:

Smoke Rating:	4 - 5	1=fog; 10= no smoke
Clean Burn™:	3 - 5	1=heavy deposits; 10=no carbon
Film Strength:	10	1=failure; 10=virtually no wear
Viscosity @100°F:	950 - 1100 SUS 50 W	@ **40°C:** 220 cSt
Pour Point:	0°F	
Flash Point:	520°F	
RPM Limit:	Unlimited	
Rust Prevention:	Contain rust inhibitors. Not recommended as a storage lubricant.	

Other additives: Most glow fuels seem to contain rust inhibitors, but I haven't found any information about what these chemicals are or how effective they might be. Apparently they can only be added at a low concentration because otherwise they'll interfere with the combustion properties. One intriguing suggestion found in a discussion group is the addition of up to 3% acetone. Among the claims made for acetone is that it helps with cold starting, by virtue of its greater volatility. It is also said to reduce backfiring in four strokes, improve the running of "difficult" engines, and improve fuel that has been allowed to absorb too much water. Sounds like a lot of promises, but has anyone tried this?